



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/757,772

01/14/2004

Francesco Pappalardo

854063.740

5496

38106

7590

01/08/2009

SEED INTELLECTUAL PROPERTY LAW GROUP PLLC  
701 FIFTH AVENUE, SUITE 5400  
SEATTLE, WA 98104-7092

EXAMINER

HOUSHMAND, HOOMAN

ART UNIT

PAPER NUMBER

2419

MAIL DATE

DELIVERY MODE

01/08/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/757,772	<b>Applicant(s)</b> PAPPALARDO ET AL.	
	<b>Examiner</b> Hooman Houshmand	<b>Art Unit</b> 2419	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 October 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-24 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Response to Amendment***

1. The rejections of claim 25 have been withdrawn because the claim has been canceled.
2. Claims 13, 17 are amended. Claim 25 is canceled. Claims 1-24 are pending.

### ***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 13-16, 17-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

5. The new limitations, claim 17 lines 11-13 (complete limitation lines 8-13) and claim 13 lines 10-11 (complete limitation lines 7-11) were not described in the original disclosure. The support for these new limitations is given (on page 13 of the remarks lines 16-24) as: page 23, lines 12-24 of the present application and Figures 5 and 9; "Data OUT" signal (the signal that transmits said data), identity signal is depicted as the "Sync" signal. The claims (claim 13 line 7 and claim 17 line 8) call for "*transmitting on*

*said single line*". However, "Data OUT" and "Sync", as shown in the drawings, are clearly two different lines.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 13-16, 17-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

8. The new limitations, claim 17 lines 11-13 and claim 13 lines 10-11, are unclear. The support for these new limitations is given (on page 13 of the remarks lines 16-24) as: page 23, lines 12-24 of the present application and Figures 5 and 9. "Data OUT" signal (the signal that transmits said data); identity signal is depicted as the "Sync" signal. The claims (claim 13 line 7 and claim 17 line 8) call for "*transmitting on said single line*". However, "Data OUT" and "Sync", as shown in the drawings, are two separate lines.

### ***Claim Rejections - 35 USC § 103***

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2419

10. Claims 1-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Curran (US 5572736) in view of Szepesi (US 5680300).

Regarding **Claim 1**: Curran teaches *a method for transmitting data on a bus* (col 1 lines 16-18) *with minimization of the bus switching activity* (col 2 lines 6-8), *converting the datum (bits) to be transmitted from its own original format into a transmission format* (switching codes and code word col 2 lines 5-8, col 4 lines 51-59) *that reduces the bus switching activity* (minimize the number of bits which switch between the zero and one states col 2 lines 2-14), *converting including: swapping the position of one or more bits of the datum to be transmitted* (a function of the data word to be transmitted col 2 lines 10-11), *swapping being performable according to a plurality of different variants* (the resulting code words represent the possible code words which could be transmitted col 2 lines 32-34), *each of which is identified by a respective sorting pattern* (a set of maximally distant mappings is derived col 2 lines 30-31, col 2 lines 59-65); *and selecting, between the various sorting patterns* (the code word which is minimally distant from the previous code word is selected col 2 lines 34-35), *a sorting pattern that reduces the bus switching activity upon transmission on the bus* (the number of bus drivers to be switched reduced col 2 lines 36-37) *of the datum generated using selected sorting pattern* (switching code identifying the mapping code col 2 lines 60-63); *transmitting on the bus the datum in transmission format; transmitting on the bus the selected sorting pattern* (switching code identifying the mapping code col 2 lines 60-65);

Art Unit: 2419

*receiving the datum in transmission format (receiving circuit); receiving the selected sorting pattern transmitted on the bus (code word); and converting the datum received from transmission format to original format using the selected sorting pattern received (receiving circuit, maps the received code word into the original data word, as that data word existed prior to transmission col 2 lines 63-65), a succession of sorting patterns generated at a transmission end (resulting code words represent the possible code words which could be transmitted col 2 lines 32-34) and a succession of sorting patterns generated at a reception end (receiver generates new mappings col 4 lines 42-59) are synchronized with each using a common clock signal (synchronization signal, push-pull bus driver col 4 lines 6-21).*

Curran does not explicitly teach push-pull bus driver used for *synchronization*.

Szepesi teaches *synchronization* with push-pull drive (col 6 lines 18-34).

Both Szepesi and Curran are in the electronics field; using electronics for timing, their art is analogous.

Teachings of Szepesi and Curran may be combined - using a push-pull drive to achieve synchronization - to produce the applicant's invention.

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Curran teaches *transmitting and receiving on the bus the selected sorting pattern* (switching code identifying the mapping code col 2 lines 60-65).

Curran does not explicitly teach *transmitting on one additional line of the bus the selected sorting pattern*.

It would have been obvious; to a person having ordinary skill in the art, at the time that the invention was made, that the two above limitations are obvious variants of one another. In the first limitation *the selected sorting pattern is transmitted and received on the bus*. The variant is *the selected sorting pattern is transmitted on one additional line of the bus*. A person having ordinary skill in the art would recognize that the functionality of the two structures is the same. The second structure has an additional line; however, the information that was originally carried on one bus is now carried on two communication lines.

Regarding **Claim 2**: Curran teaches *generating a succession of sorting patterns identifying all the possible swaps of the position of the bit or bits of the datum to be transmitted* (resulting code words represent the possible code words which could be transmitted col 2 lines 32-34); *comparing the optimal - particular - sorting pattern to be transmitted with the sorting patterns generated* (set of maximally distant mappings derived col 2 lines 30-31); *generating and transmitting on the bus a synchronization* (push-pull bus driver col 4 lines 6-21) *signal upon detection of the coincidence* (minimally distant) *between the optimal - particular - sorting pattern to be transmitted and one of the sorting patterns generated* (the code word which is minimally distant from the previous code word is selected col 2 lines 34-35).

Curran does not explicitly teach push-pull bus driver used for *synchronization*.

Szepesi teaches *synchronization* with push-pull drive (col 6 lines 18-34).

Both Szepesi and Curran are in the electronics field; using electronics for timing, their art is analogous.

Teachings of Szepesi and Curran may be combined - using a push-pull drive to achieve synchronization - to produce the applicant's invention.

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Regarding **Claim 3**: Curran teaches *receiving the selected sorting pattern transmitted on the bus includes generating a succession of sorting patterns (mappings) identical to, and synchronous* (instead of complementing an entire word - bus inverted – mapping codes are generated col 4 lines 42-59) *with, the generated succession of sorting patterns identifying all possible swaps of the position of the bit or bits of the datum to be transmitted* (resulting code words represent the possible code words which could be transmitted col 2 lines 32-34) *and identifying the sorting pattern generated at the instant of reception of the synchronization* (push-pull bus driver col 4 lines 6-21) *signal transmitted on the bus* (At the receiving end, the bits of the code word identified by the switching code are modified to reconstruct the transmitted data word col 3 lines 7-9), *the sorting pattern identified being identical to said selected sorting pattern to be transmitted* (receiving circuit maps the received code word into the original data word, as that data word existed prior to transmission col 2 lines 63-65).



Curran does not explicitly teach push-pull bus driver used for *synchronization*.

Szepesi teaches *synchronization* with push-pull drive (col 6 lines 18-34).

Both Szepesi and Curran are in the electronics field; using electronics for timing, their art is analogous.

Teachings of Szepesi and Curran may be combined - using a push-pull drive to achieve synchronization - to produce the applicant's invention.

It would have been obvious; at the time the invention was made, to a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Regarding **Claim 4**: Curran teaches *the sorting pattern selected reduces the bus switching activity (zero and one switching) to a minimum amount (minimize the number of bits which switch between the zero and one states col 2 lines 6-7) and the sorting pattern selected is the optimal (reduced delta-I noise and power consumption) sorting pattern* (the number of bit drivers which are required to switch between the zero and one position is reduced, thereby substantially reducing the delta-I noise and power consumption col 2 lines 55-58).

Regarding **Claim 5**: Curran teaches *generating a succession of sorting patterns (set of maximally distant mappings is derived col 2 lines 30-31) includes providing a finite state machine (a model of the algorithm, IEEE definition) having a number of internal states (the generated code words) equal to the number of possible swaps of the position of the*

Art Unit: 2419

*bit or bits of the datum to be transmitted* (plurality of the generated code words, the one which differs in the smallest number of bit positions from the previously transmitted code word is selected col 2 lines 51-55); *associating to each of the internal states of finite state machine a respective sorting pattern* (a plurality of mapping codes are generated, each identified by the state of the switch bits col 4 lines 44-46); *and operating finite state machine at a given frequency so as to cause its internal state to evolve* (compute) *and generate said sorting patterns* (Each of the code words is compared with a previously transmitted code word and the Hamming distance between each of the generated code words and the previously transmitted code word are computed. The code word with the lowest Hamming distance is selected and transmitted in the next bus cycle col 4 lines 51-57).

Curran teaches *using the same clock signal* (push-pull bus driver col 4 lines 6-21).

Curran does not explicitly teach push-pull bus driver used for *synchronization*.

Szepesi teaches *synchronization* with push-pull drive (col 6 lines 18-34).

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Regarding **Claim 6**: Curran teaches *generating a succession of sorting patterns includes generating a plurality of disjoint sets of sorting patterns* (set of maximally distant mappings is derived col 2 lines 30-31), *each set being formed by a sorting*

*pattern identifying a respective subset of possible swaps of the position of the bit or bits of the datum to be transmitted (one of the generated code words which differs in the smallest number of bit positions from the previously transmitted code word is selected col 2 lines 51-55), the sorting patterns of each set being further generated in succession and in a synchronous (instead of complementing an entire word - bus inverted – mapping codes are generated col 4 lines 42-59) way with respect to the sorting patterns of the other sets (a plurality of mapping codes are generated col 4 lines 44-46).*

Regarding **Claim 7**: Curran teaches *generating a plurality of separate sets of sorting patterns (set of maximally distant mappings is derived col 2 lines 30-31) includes, for each said set of sorting patterns, providing a finite state machine (a model of the algorithm – IEEE definition) having a number of internal states (the generated code words) equal to the number of sorting patterns in the set (one of the generated code words which differs in the smallest number of bit positions from the previously transmitted code word is selected col 2 lines 51-55); associating to each of the internal states of said finite state machine a respective sorting pattern (a plurality of mapping codes are generated, each identified by the state of the switch bits col 4 lines 44-46); and operating said finite state machine at a given frequency so as to cause its internal state to evolve (compute) and generate the corresponding sorting patterns (each of the code words is compared with a previously transmitted code word and the Hamming distance between each of the generated code words and the previously transmitted*

Art Unit: 2419

code word are computed. The code word with the lowest Hamming distance is selected and transmitted in the next bus cycle col 4 lines 51-57).

Curran teaches *using the same clock signal* (push-pull bus driver col 4 lines 6-21).

Curran does not explicitly teach push-pull bus driver used for *synchronization*.

Szepesi teaches *synchronization* with push-pull drive (col 6 lines 18-34).

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Regarding **Claim 8**: Curran teaches *a device and system for transmitting data on a bus* (col 1 lines 16-18) *with minimization of the bus switching activity* (col 2 lines 6-8), *first converting means for converting the datum (bits) to be transmitted from its own original format to a transmission format* (switching codes and code word col 2 lines 5-8, col 4 lines 51-59) *that minimizes the bus switching activity* (minimize the number of bits which switch between the zero and one states col 2 lines 2-14), *first converter means includes a swap operator for swapping the position of one or more bits of the datum to be transmitted* (a function of the data word to be transmitted col 2 lines 10-11), *swapping being performable according to different variants* (the resulting code words represent the possible code words which could be transmitted col 2 lines 32-34), *each of which is identified by a respective sorting pattern* (a set of maximally distant mappings is derived col 2 lines 30-31); *and selecting means for selecting, between the various sorting*

*patterns* (the code word which is minimally distant from the previous code word is selected col 2 lines 34-35), *an optimal sorting pattern that minimizes the bus switching activity* (the number of bus drivers to be switched reduced col 2 lines 36-37) *upon transmission on the bus of the datum generated using optimal sorting pattern* (switching code identifying the mapping code col 2 lines 60-63); *transmitting means for transmitting on the bus the datum in transmission format and the optimal sorting pattern*; *receiving means for receiving the datum in transmission format and optimal sorting pattern* (code word) *transmitted on the bus*; and *second converting means for converting the datum received from transmission format to original format using optimal sorting pattern received* (receiving circuit, maps the received code word into the original data word, as that data word existed prior to transmission col 2 lines 63-65), *transmitting means includes first sorting pattern generating means for generating a succession of sorting patterns identifying all the possible swaps of the position of the bit or bits of the datum to be transmitted* (resulting code words represent the possible code words which could be transmitted col 2 lines 32-34); *comparing means for comparing the optimal sorting pattern to be transmitted with the sorting patterns generated* (set of maximally distant mappings derived col 2 lines 30-31); *signal generating means for generating and sending onto bus a synchronization* (push-pull bus driver col 4 lines 6-21) *signal upon detection of the identity* (minimally distant) *between the optimal sorting pattern to be transmitted and one of the sorting patterns generated* (the code word which is minimally distant from the previous code word is selected col 2 lines 34-35), *receiving means includes second sorting pattern generating means for generating a succession of*

Art Unit: 2419

*sorting patterns* (mappings) *identical to, and synchronous* (instead of complementing an entire word - bus inverted – mapping codes are generated col 4 lines 42-59) *with, the sorting patterns generated by the first sorting pattern generating means for transmission* (receiver applies reverse mapping to recover the original data word, it makes a state transition from the last state it was in to a new state, col 4 lines 57-59); *and detecting means for identifying the sorting pattern generated by second sorting pattern generating means at the instant of reception of the synchronization* (push-pull bus driver col 4 lines 6-21) *signal transmitted on the bus* (at the receiving end, the bits of the code word identified by the switching code are modified to reconstruct the transmitted data word col 3 lines 7-9), *the sorting pattern identified being identical to optimal sorting pattern to be transmitted* (receiving circuit maps the received code word into the original data word, as that data word existed prior to transmission col 2 lines 63-65), *a succession of sorting patterns generated at a transmission end* (resulting code words represent the possible code words which could be transmitted col 2 lines 32-34) *and a succession of sorting patterns generated at a reception end* (receiver generates new mappings col 4 lines 42-59) are synchronized with each using a common clock signal (synchronization signal, push-pull bus driver col 4 lines 6-21).

Curran does not explicitly teach: push-pull bus driver used for *synchronization*.

Szepesi teaches: *synchronization* with push-pull drive (col 6 lines 18-34).

Both Szepesi and Curran are in the electronics field, their art is analogous.

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Curran teaches *transmitting and receiving on the bus the selected sorting pattern* (switching code identifying the mapping code col 2 lines 60-65).

Curran does not explicitly teach *transmitting on one additional line of the bus the selected sorting pattern*.

It would have been obvious; to a person having ordinary skill in the art, at the time that the invention was made, that the two above limitations are obvious variants of one another. In the first limitation *the selected sorting pattern is transmitted and received on the bus*. The variant is *the selected sorting pattern is transmitted on one additional line of the bus*. A person having ordinary skill in the art would recognize that the functionality of the two structures is the same. The second structure has an additional line; however, the information that was originally carried on one bus is now carried on two communication lines.

Regarding **Claim 9**: Curran teaches *first and second sorting pattern generating means each comprise a finite state machine (a model of the algorithm – IEEE definition) having a number of internal states (the generated code words) equal to the number of possible swaps of the position of the bit or bits of the datum to be transmitted (one of the generated code words which differs in the smallest number of bit positions from the previously transmitted code word is selected col 2 lines 51-55), a respective sorting*

Art Unit: 2419

*pattern* (a plurality of mapping codes are generated, each identified by the state of the switch bits col 4 lines 44-46) *being associated to each of the internal states of finite state machine, finite state machine being operated at a given frequency so as to cause its internal state to evolve (compute) and generate sorting patterns* (each of the code words is compared with a previously transmitted code word and the Hamming distance between each of the generated code words and the previously transmitted code word are computed. The code word with the lowest Hamming distance is selected and transmitted in the next bus cycle col 4 lines 51-57).

Regarding **Claim 10**: Curran teaches *first and second sorting pattern generating means each comprise a plurality of sorting pattern modules generating a plurality of disjoint sets of sorting patterns* (set of maximally distant mappings is derived col 2 lines 30-31), *each set being formed by a sorting pattern identifying a respective subset of all the possible swaps of the position of the bit or bits of the datum to be transmitted* (one of the generated code words which differs in the smallest number of bit positions from the previously transmitted code word is selected col 2 lines 51-55), *the sorting patterns of each set being further generated in succession and in a synchronous* (instead of complementing an entire word - bus inverted – mapping codes are generated col 4 lines 42-59) *way with respect to the sorting patterns of the other sets* (a plurality of mapping codes are generated col 4 lines 44-46).



Art Unit: 2419

Regarding **Claim 11**: Curran teaches *each sorting pattern* (set of maximally distant mappings is derived col 2 lines 30-31) *generating modules comprises a finite state machine* (a model of the algorithm – IEEE definition) *having a number of internal states* (the generated code words) *equal to the number of sorting patterns of the corresponding set* (one of the generated code words which differs in the smallest number of bit positions from the previously transmitted code word is selected col 2 lines 51-55), *a respective sorting pattern being associated to each of the internal states of said finite state machine* (a plurality of mapping codes are generated, each identified by the state of the switch bits col 4 lines 44-46), *finite state machine being operated at a given frequency so as to cause its internal state to evolve* (compute) *and generate sorting patterns* (each of the code words is compared with a previously transmitted code word and the Hamming distance between each of the generated code words and the previously transmitted code word are computed. The code word with the lowest Hamming distance is selected and transmitted in the next bus cycle col 4 lines 51-57).

Curran teaches *using the same clock signal* (push-pull bus driver col 4 lines 6-21).

Curran does not explicitly teach push-pull bus driver used for *synchronization*.

Szepesi teaches *synchronization* with push-pull drive (col 6 lines 18-34).

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Art Unit: 2419

Regarding **Claim 12**: Curran teaches *a computer product (col 1 line 16) loadable into a memory associated with a bus, said computer product having portions of software code that (computer system, data is transmitted as a multi-bit data word between units such as processors and memories, by means of bus driver circuits col 1 lines 16-18) are executable by a processor to minimize bus switching activity (minimize the number of bits which switch between the zero and one states col 2 lines 2-14), by converting a datum to be transmitted from its own original format into a transmission format that reduces the bus switching activity (a function of the data word to be transmitted col 2 lines 10-11), converting includes swapping a position of one or more bits of the datum to be transmitted, said swapping being performable according to a plurality of different variants (The resulting code words represent the possible code words which could be transmitted col 2 lines 32-34), each of which is identified by a respective sorting pattern (a set of maximally distant mappings is derived col 2 lines 30-31); and selecting, between the sorting patterns (the code word which is minimally distant from the previous code word is selected col 2 lines 34-35), a particular sorting pattern that reduces the bus switching activity (the number of bus drivers to be switched reduced col 2 lines 36-37) upon transmission on the bus of the datum generated using selected sorting pattern (switching code identifying the mapping code col 2 lines 60-63); transmitting on the bus the datum in said transmission format; and transmitting on the bus a synchronization (push-pull bus driver col 4 lines 6-21) signal usable by a receiving device to identify selected sorting pattern from sorting patterns (at the receiving end, the bits of the code word identified by the switching code are modified to reconstruct the*

Art Unit: 2419

transmitted data word col 3 lines 7-9), *a succession of sorting patterns generated at a transmission end* (resulting code words represent the possible code words which could be transmitted col 2 lines 32-34) *and a succession of sorting patterns generated at a reception end* (receiver generates new mappings col 4 lines 42-59) *are synchronized with each using a common clock signal* (synchronization signal, push-pull bus driver col 4 lines 6-21).

Curran does not explicitly teach: push-pull bus driver used for *synchronization*.

Szepesi teaches: *synchronization* with push-pull drive (col 6 lines 18-34).

Both Szepesi and Curran are in the electronics field; using electronics for timing, their art is analogous.

Teachings of Szepesi and Curran may be combined - using a push-pull drive to achieve synchronization - to produce the applicant's invention.

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Curran teaches *transmitting and receiving on the bus the selected sorting pattern* (switching code identifying the mapping code col 2 lines 60-65).

Curran does not explicitly teach *transmitting on one additional line of the bus the selected sorting pattern*.

It would have been obvious; to a person having ordinary skill in the art, at the time that the invention was made, that the two above limitations are obvious variants of one another. In the first limitation *the selected sorting pattern is transmitted and*

Art Unit: 2419

*received on the bus. The variant is the selected sorting pattern is transmitted on one additional line of the bus. A person having ordinary skill in the art would recognize that the functionality of the two structures is the same. The second structure has an additional line; however, the information that was originally carried on one bus is now carried on two communication lines.*

Regarding **Claim 13**: Curran teaches *transmitting  $n$ -bit data on a single line, generating in succession all the possible combinations of  $n$  bits (code words col 2 lines 31-35); comparing the  $n$ -bit datum to be transmitted with the combinations of  $n$  bits generated (set of maximally distant mappings derived col 2 lines 30-31); generating and transmitting on a single line an identity signal (minimally distant) upon detection of the coincidence between the  $n$ -bit datum to be transmitted and one of the combinations of  $n$  bits generated (the code word which is minimally distant from the previous code word is selected col 2 lines 34-35) , and in reception, generating a succession of combinations of  $n$  bits (mappings) identical and synchronous to the combinations generated in succession in transmission (receiver applies reverse mapping to recover the original data word col 4 lines 57-59, the receiver transitions from the previous state to the new state, mapping codes are generated col 4 lines 42-59); and identifying the combination of  $n$  bits generated at the instant of reception of the identity signal transmitted on the single line (at the receiving end, the bits of the code word identified by the switching code are modified to reconstruct the transmitted data word col 3 lines 7-9), the combination of  $n$  bits identified being identical - corresponding - to the  $n$ -bit datum to be*

Art Unit: 2419

*transmitted* (receiving circuit maps the received code word into the original data word, as that data word existed prior to transmission col 2 lines 63-65), *a succession of sorting patterns generated at a transmission end* (resulting code words represent the possible code words which could be transmitted col 2 lines 32-34) *and a succession of sorting patterns generated at a reception end* (receiver generates new mappings col 4 lines 42-59) *are synchronized with each using a common clock signal* (synchronization signal, push-pull bus driver col 4 lines 6-21).

Curran does not explicitly teach: push-pull bus driver used for *synchronization*.

Szepesi teaches: *synchronization* with push-pull drive (col 6 lines 18-34).

Both Szepesi and Curran are in the electronics field; using electronics for timing, their art is analogous.

Teachings of Szepesi and Curran may be combined - using a push-pull drive to achieve synchronization - to produce the applicant's invention.

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Regarding **Claim 14**: Curran teaches *generating in succession all the possible combinations of  $n$  bits* (set of maximally distant mappings is derived col 2 lines 30-31), *in transmission and reception* (corresponding states exist at both the transmitter and receiver - the code words. The switch bits indicate which state to transition to next. These switch bits are calculated at the transmitter, and communicated to the receiver

Art Unit: 2419

4:42-59), *includes providing a finite state machine* (a model of the algorithm – IEEE definition) *having a number of internal states* (the generated code words) *equal to the number of possible combinations of  $n$  bits* (plurality of the generated code words, the one which differs in the smallest number of bit positions from the previously transmitted code word is selected col 2 lines 51-55); *associating to each of the internal states of finite state machine a respective combination of  $n$  bits* (a plurality of mapping codes are generated, each identified by the state of the switch bits col 4 lines 44-46); *and operating finite state machine at a given frequency so as to cause its internal state to evolve (compute) and generate the corresponding combinations of  $n$  bits* (each of the code words is compared with a previously transmitted code word and the Hamming distance between each of the generated code words and the previously transmitted code word are computed. The code word with the lowest Hamming distance is selected and transmitted in the next bus cycle col 4 lines 51-57).

Curran teaches *using the same clock signal* (push-pull bus driver col 4 lines 6-21).

Curran does not explicitly teach push-pull bus driver used for *synchronization*.

Szepesi teaches *synchronization* with push-pull drive (col 6 lines 18-34).

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Regarding **Claim 15**:

Art Unit: 2419

Curran teaches *generating the combinations of  $n$  bits includes generating a plurality of disjoint sets of possible combinations of  $n$  bits* (set of maximally distant mappings is derived col 2 lines 30-32), *in transmission and reception* (corresponding states exit at both the transmitter and receiver - the code words. The switch bits indicate which state to transition to next. These switch bits are calculated at the transmitter, and communicated to the receiver 4:42-59), *the combinations of  $n$  bits of each set being further generated in succession and in a synchronous* (instead of complementing an entire word - bus inverted – mapping codes are generated col 4 lines 42-59) way with respect to the combinations of  $n$  bits of the other sets (a plurality of mapping codes are generated col 4 lines 44-46).

Regarding **Claim 16**: Curran teaches, *in transmission and reception* (corresponding states exit at both the transmitter and receiver, the code words. The switch bits indicate which state to transition to next. These switch bits are calculated at the transmitter, according to the data to be transmitted, and communicated to the receiver 4:42-59), *generating a plurality of disjoint sets of possible combinations of  $n$  bits* (set of maximally distant mappings is derived col 2 lines 30-32) *includes, for each set of combinations of  $n$  bits, providing a finite state machine* (a model of the algorithm – IEEE definition) *having a number of internal states* (the generated code words) *equal to the number of combinations of  $n$  bits in the set* (plurality of the generated code words, the one which differs in the smallest number of bit positions from the previously transmitted code word is selected col 2 lines 51-55); *associating to each of the internal states of finite state*

Art Unit: 2419

*machine a respective combination of  $n$  bits* (a plurality of mapping codes are generated, each identified by the state of the switch bits col 4 lines 44-46); *and operating finite state machine at a given frequency so as to cause its internal state to evolve* (compute) *and generate the corresponding combinations of  $n$  bits* (each of the code words is compared with a previously transmitted code word and the Hamming distance between each of the generated code words and the previously transmitted code word are computed. The code word with the lowest Hamming distance is selected and transmitted in the next bus cycle col 4 lines 51-57).

Curran teaches *using the same clock signal* (push-pull bus driver col 4 lines 6-21).

Curran does not explicitly teach push-pull bus driver used for *synchronization*.

Szepesi teaches *synchronization* with push-pull drive (col 6 lines 18-34).

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Regarding **Claim 17**: Curran teaches *a system for transmitting  $n$ -bit data on a single line, including, at the transmission end: first combination generating means for generating in succession all the possible combinations of  $n$  bits* (resulting code words represent the possible code words which could be transmitted col 2 lines 32-34); *comparing means for comparing the  $n$ -bit datum to be transmitted with the combinations of  $n$  bits generated* (set of maximally distant mappings derived col 2 lines 30-32); *signal*



Art Unit: 2419

*generating means for generating and transmitting on a single line an identity signal upon detection (minimally distant) of the coincidence between the n-bit datum to be transmitted and one of the combinations of n bits generated (the code word which is minimally distant from the previous code word is selected col 2 lines 34-35); at the reception end: second combination generating means for generating the same succession of combinations of n bits (receiver applies reverse mapping to recover the original data word col 4 lines 57-59, the state transitions to the new state), generated by the first combination generating means, the successions of combinations of n bits as that generated by the said first and second combination-generating means being synchronized (push-pull bus driver col 4 lines 6-21; instead of complementing an entire word - bus inverted – mapping codes are generated col 4 lines 42-59) with one another; and detecting means for identifying the combination of n bits generated, by receiver, at the instant of reception of the identity signal transmitted on the single line (at the receiving end, the bits of the code word identified by the switching code are modified to reconstruct the transmitted data word col 3 lines 7-9) , the combination of n bits identified being identical, corresponding, to the n-bit datum to be transmitted (receiving circuit maps the received code word into the original data word, as that data word existed prior to transmission col 2 lines 63-65), a succession of sorting patterns generated at a transmission end (resulting code words represent the possible code words which could be transmitted col 2 lines 32-34) and a succession of sorting patterns generated at a reception end (receiver generates new mappings col 4 lines 42-59) are*

Art Unit: 2419

*synchronized with each using a common clock signal* (synchronization signal, push-pull bus driver col 4 lines 6-21).

Curran does not explicitly teach: push-pull bus driver used for *synchronization*.

Szepesi teaches: *synchronization* with push-pull drive (col 6 lines 18-34).

Both Szepesi and Curran are in the electronics field; using electronics for timing, their art is analogous.

Teachings of Szepesi and Curran may be combined - using a push-pull drive to achieve synchronization - to produce the applicant's invention.

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Regarding **Claim 18**: Curran teaches *a finite state machine* (a model of the algorithm – IEEE definition) *having a number of internal states* (the generated code words) *equal to the number of possible combinations of  $n$  bits* (plurality of the generated code words, the one which differs in the smallest number of bit positions from the previously transmitted code word is selected col 2 lines 51-55), *a respective combination of  $n$  bits being associated to each of the internal states of finite state machine* (a plurality of mapping codes are generated, each identified by the state of the switch bits col 4 lines 44-46) , *and finite state machine being operated at a given frequency so as to cause its internal state to evolve* (compute) *and generate the corresponding combinations of  $n$  bits* (each of the code words is compared with a previously transmitted code word and

Art Unit: 2419

the Hamming distance between each of the generated code words and the previously transmitted code word are computed. The code word with the lowest Hamming distance is selected and transmitted in the next bus cycle col 4 lines 51-57).

Curran teaches *using the same clock signal* (push-pull bus driver col 4 lines 6-21).

Curran does not explicitly teach push-pull bus driver used for *synchronization*.

Szepesi teaches *synchronization* with push-pull drive (col 6 lines 18-34).

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Regarding **Claim 19**: Curran teaches *combination generating modules generating a plurality of disjoint sets of possible combinations of  $n$  bits* (set of maximally distant mappings is derived col 2 lines 30-32), *the combinations of  $n$  bits of each set being generated in succession and in a synchronous* (instead of complementing an entire word - bus inverted – mapping codes are generated col 4 lines 42-44) way with respect to the combinations of  $n$  bits of the other sets (a plurality of mapping codes are generated col 4 lines 44-46).

Regarding **Claim 20**: Curran teaches *combination generating modules* (set of maximally distant mappings is derived col 2 lines 30-31) *comprises a finite state machine* (a model of the algorithm – IEEE definition) *having a number of internal states* (the generated

Art Unit: 2419

code words) *equal to the number of combinations of  $n$  bits in the set* (plurality of the generated code words, the one which differs in the smallest number of bit positions from the previously transmitted code word is selected col 2 lines 51-55), *a respective combination of  $n$  bits being associated to each of the internal states of finite state machine* (a plurality of mapping codes are generated, each identified by the state of the switch bits col 4 lines 44-46) , *and finite state machine being operated at a given frequency so as to cause its internal state to evolve (compute) and generate the corresponding combinations of  $n$  bits* (each of the code words is compared with a previously transmitted code word and the Hamming distance between each of the generated code words and the previously transmitted code word are computed. The code word with the lowest Hamming distance is selected and transmitted in the next bus cycle col 4 lines 51-57).

Curran teaches *using the same clock signal* (push-pull bus driver col 4 lines 6-21).

Curran does not explicitly teach push-pull bus driver used for *synchronization*.

Szepesi teaches *synchronization* with push-pull drive (col 6 lines 18-34).

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Regarding **Claim 21**: Curran teaches *a computer product* (col 1 line 16) *loadable into memory, including software code that implement the method* (computer system, data is

Art Unit: 2419

transmitted as a multi-bit data word between units such as processors and memories, by means of bus driver circuits col 1 lines 16-18) *when the computer product is executed by a digital processor associated to the bus* (col 1 lines 17-18).

Regarding **Claim 22**: Curran teaches *a transmitter device* (col 1 lines 16-18), *a converter to convert a datum to be transmitted from an initial format to a transmission format* (switching codes and code word col 2 lines 5-8, col 4 lines 51-59), *transmission format being a selected sorting pattern from among a succession of sorting patterns that identify possible swaps of bit positions of datum* (the resulting code words represent the possible code words which could be transmitted col 2 lines 32-34); *a first finite state machine having a number of internal states* (the generated code words) *equal to a number of sorting patterns* (plurality of the generated code words, the one which differs in the smallest number of bit positions from the previously transmitted code word is selected col 2 lines 51-55) *and each of internal states respectively corresponding to one of sorting patterns* (a plurality of mapping codes are generated, each identified by the state of the switch bits col 4 lines 44-46); *and a common clock* (synchronization signal, push-pull bus driver col 4 lines 6-21) *adapted coupled to first finite state machine* (IEEE definition: a computational model consisting of a finite number of states and transitions between those states, possibly with accompanying actions) *to synchronize first finite state machine with a second finite state machine, at a receiving end* (corresponding states exist at both the transmitter and receiver - the code words. The switch bits indicate which state to transition to next. These switch bits are calculated at the transmitter, and

Art Unit: 2419

communicated to the receiver 4:42-59), *that receives datum in transmission format* (switching codes and code word col 2 lines 5-8, col 4 lines 51-59) *and that has a number of internal states* (the generated code words) *equal to number of sorting patterns* (resulting code words represent the possible code words col 2 lines 32-34) *and each of internal states of second finite state machine at the receiving end respectively corresponding to one of sorting patterns, first finite state machine is adapted to generate a synchronization signal to be received by second state machine, synchronization signal* (push-pull bus driver col 4 lines 6-21) *corresponding to a particular state of first finite state machine and adapted to be used by second finite state machine to identify selected sorting pattern* (switching code identifying the mapping code col 2 lines 60-63) (the generated code word which differs in the smallest number of bit positions from the previously transmitted code word is selected col 2 lines 51-55).

Curran does not explicitly teach: push-pull bus driver used for *synchronization*.

Szepesi teaches: *synchronization* with push-pull drive (col 6 lines 18-34).

Both Szepesi and Curran are in the electronics field; using electronics for timing, their art is analogous.

Teachings of Szepesi and Curran may be combined - using a push-pull drive to achieve synchronization - to produce the applicant's invention.

It would have been obvious; at the time the invention was made, for a person having ordinary skill in the art to combine the teachings of Szepesi with Curran to produce accurate reception of data at the receiver.

Curran teaches *transmitting and receiving on the bus the selected sorting pattern* (switching code identifying the mapping code col 2 lines 60-65).

Curran does not explicitly teach *transmitting on one additional line of the bus the selected sorting pattern*.

It would have been obvious; to a person having ordinary skill in the art, at the time that the invention was made, that the two above limitations are obvious variants of one another. In the first limitation *the selected sorting pattern is transmitted and received on the bus*. The variant is *the selected sorting pattern is transmitted on one additional line of the bus*. A person having ordinary skill in the art would recognize that the functionality of the two structures is the same. The second structure has an additional line; however, the information that was originally carried on one bus is now carried on two communication lines.

Regarding **Claim 23**: Curran teaches (7:16-47) *a register to store sorting patterns*.

Regarding **Claim 24**: Curran teaches *sorting patterns are from among a plurality of disjoint sets of sorting patterns* (set of maximally distant mappings is derived col 2 lines 30-31).

### ***Response to Arguments***

11. Applicant's arguments filed on 10/22/2008 have been fully considered but they are not persuasive.

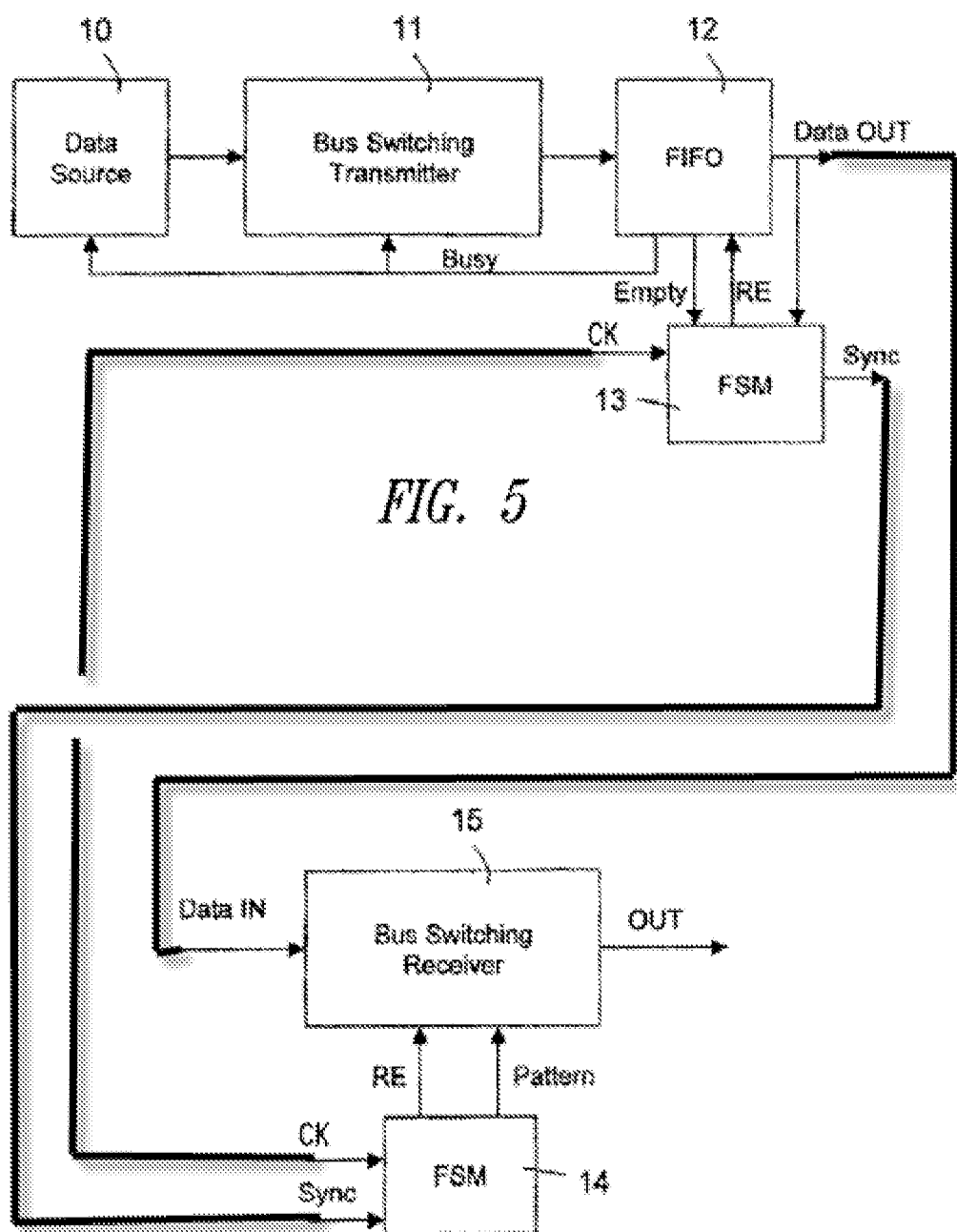
Art Unit: 2419

12. The main argument on pages 14-21 (and similar argument on pages 21-22) is that the limitations in claim 1 are not disclosed by the references. The examiner respectfully disagrees. A clarification of the rejection follows: The main argument is regarding the modification of the single bus architecture of the reference to meet the dual bus architecture of the invention. In multiplex architectures, it is well known that various communication buses are multiplexed onto a single bus. However, it is also well known that it might be desirable to have multiple channels to separate control and data. In this fashion the control signals could use longer pulses and have longer sample and hold integration times and be more immune to noise. Also, it might be desirable to send precise timing information on a separate channel for similar reasons and have a dedicated channel for system synchronization. Another advantage is that the information is transmitted in parallel and hence the throughput of the overall system is increased. Another variant is to transmit the information, or selected portions of the information, redundantly on a second bus – the motivation is that redundancy increases the fault tolerance of the system and provides enhanced error checking capability. The design tradeoff of having additional buses is cost. The number of wires / fiber optic lines would increase. There would be additional manufacturing, service, warranty costs. As illustrated above multiplexing multiple signals onto one bus or dividing / replicating a signal or a portion of a signal from one bus onto multiple buses are design choices that optimize several factors such as cost, throughput, SNR, probability of error, reliability, fail softing, fault tolerance. A person having ordinary skill in the multiplex art is familiar with these design tradeoffs and depending on the performance specification will choose



one of the modifications listed above to meet the design requirements. The modification of the reference such that the *selected sorting pattern* is redundantly *transmitted on one additional line of the bus* - is within the design analysis listed above. A designer would consider this design choice in the process of deciding on optimal design given the requirements for cost, throughput, SNR, probability of error, reliability, fail softing, fault tolerance, redundancy.

13. The second argument is that the *same clock signal* limitation of the claim 1 is not disclosed by the references. The examiner respectfully disagrees. A clarification of the rejection follows: The following is the drawing of the invention with the bus communication lines from the transmitter connected to the receiver.

*FIG. 6*

The Data OUT line is connected to Data IN line. The Sync line from the transmitter is connected to Sync line of the receiver. The CK line from the transmitter is connected to CK line of the receiver. Having the same clock signal or the same timing signal in communication systems is well known in the art. Some of the well known implementations include: having a dedicated line/bus/channel that provides the clock/timing signal; and, recovering the timing/clock signal from the activity on the main communication line/bus. The design choice of having a dedicated line for the timing/clock signal include: accuracy, fault detection (e.g. when this periodic signal is no longer being received). The cost associated with this choice include: increased cost for the extra line, increased manufacturing cost of the product, increase in service/warranty cost for an extra part. The cost of operating the device would increase since the clock signal needs to be continually generated at the transmitter and received at the receiver with the associate consumption of energy resource and the resulting heat generated from the operation of electronic devices. In addition this prevents the devices to enter sleep mode. The second design choice of recovering the timing/clock signal from the activity on the main communication line/bus would avoid the costs associated with operating a second line but would not have the benefits of higher accuracy, fault detection listed above. A person having ordinary skill in the multiplex art is familiar with these design choices and will consider both when designing a multiplex system. When the reference teaches one of these design choices – given the knowledge of a person having ordinary skill in the multiplex art – it would be obvious that the other design variants would have been obvious to try.

Art Unit: 2419

14. The argument on page 22 lines 5-6 (regarding claims 8, 12) "*clocking signal having the sorting pattern*" has been considered but is moot since this limitation is not in the claims.

15. Applicant's arguments, on page 22, with respect to the amended claims 13, 17 have been considered but are moot in view of the new ground(s) of rejection.

### ***Conclusion***

16. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hooman Houshmand whose telephone number is

Art Unit: 2419

(571)270-1817. The examiner can normally be reached on Monday - Friday 8am - 5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Kizou can be reached on (571)272-3088. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/H. H./  
Examiner, Art Unit 2419

/Hassan Kizou/  
Supervisory Patent Examiner, Art Unit 2419